CLAIMS

We claim:

1. A system simulating at least one natural hydraulic cue to which fish are responsive in water,
wherein said fish that respond to said at least one simulated hydraulic cue circumvent at least one barrier to the downstream migration of said fish, said barrier having at least an upstream and a downstream side.

2. The system of claim 1 in which said at least one natural hydraulic cue elicits an instinctive response of fish to select a portion of a stream having a near maximum downstream velocity vector, u, and at least minimum strain rate variables in the downstream direction with respect to the depth and the width of the stream, said variables represented mathematically as $\frac{\partial u}{\partial z}$ and $\frac{\partial u}{\partial y}$, respectively, such that both said variables ideally approach zero.

3. The system of claim 2 comprising at least an oven hood surface bypass collector (OH-SBC), having length, width and depth, a top and a bottom, an interior surface and an exterior surface, a main portion with at least one slot opening at said bottom and at least one extension that projects upstream from said at least one barrier along said width,
wherein said extension eliminates at least one zone of dead water that may be adjacent said upstream side of said barrier, and
wherein said OH-SBC is positioned with said length adjacent and parallel to said upstream side of said at least one barrier, and
wherein said top is generally parallel to the surface of said water in which said OH-SBC operates, and
wherein said depth is selected to permit passage of fish of a pre-specified size.

4. The system of claim 3, the OH-SBC further comprising:

at least one internal sluiceway circumscribed at least in part by said extension,

wherein said extension is wedge shaped with the point of the wedge positioned farthest away from said main portion,

wherein said extension maintains the same profile on its top as said main portion, being an unbroken extension thereof, and

wherein said at least one internal sluiceway runs parallel to said upstream side of said at least one barrier;

at least one collector gallery that parallels said sluiceway immediately adjacent said upstream side of said at least one barrier and is circumscribed at least in part by said main portion of said OH-SBC,

wherein said fish are attracted to said collector gallery by said simulated hydraulic cue maintained by said system, and

wherein said fish are moved around said barrier by at least partially de-watering said collector gallery; and

at least one articulating extension affixed to said lower part of said collector gallery,

wherein said articulating extension at least partially controls the angle of attack of the water that flows under said collector gallery.

5. The system of claim 3 further comprising at least one sensor,

wherein said at least one sensor alerts to changing hydraulic conditions, permitting adjustment of said system.

6. The system of claim 3 further comprising adjustable connections for affixing said OH-SBC to at least one portion of said upstream side of said barrier.

7. The system of claim 1 in which said at least one barrier is selected from the group consisting of a dam, a hydroelectric powerhouse, a weir, a boom, a berm, a sluice gate, and a spillway, and combinations thereof.

wherein each member of said group has at least one intake on said upstream side.

8. The system of claim 3 in which said OH-SBC comprises multiple modules.

9. The system of claim 3 in which said modules are associated with at least one de-watering screen for controlling the water level in each module.

10. The system of claim 8 in which said modules are connected by a manifold such that the water from each said module is maintained in a chamber associated with each said module.

11. The system of claim 7 in which said system is selected to operate at an optimum level with respect to said intake,
wherein said system operates to overcome at least one natural cue resultant from the operation of said at least one intake.

12. The system of claim 4 in which at least one visual cue is precluded.

13. The system of claim 12 in which said at least one visual cue is precluded by painting the inside of said collector gallery a neutral color.

14. The system of claim 4 in which turbulence in said collector gallery is minimized by providing a smooth surface on said interior surface of said OH-SBC and applying a coating to said smooth surface said coating having a low coefficient of friction.

15. The system of claim 7 in which said wedge-shaped extension completely covers the space above and immediately upstream of all said at least one intakes of said dam,

wherein said wedge-shaped extension further displaces any eddy otherwise occurring above said at least one intake and in the vicinity of said slot opening to said collector gallery.

16. The system of claim 4 in which at least one additional stimulus is provided in the region of said collector gallery, said stimulus selected from the group consisting essentially of natural light, artificial light, sound, and combinations thereof.

17. A method for facilitating the migration of fish downstream around a barrier having an upstream and a downstream side, comprising establishing a path in the water near said barrier, said path incorporating the simulation of at least one natural hydraulic cue used by said fish,
wherein said path leads to a safe route around said barrier.

18. The method of claim 17 in which said at least one hydraulic cue is an instinctive response of fish to select a portion of a stream having a near maximum downstream velocity vector, u, and at least minimizing strain rate variables in the downstream direction with respect to the depth and the width of the stream, said variables represented mathematically as $\frac{\partial u}{\partial z}$ and $\frac{\partial u}{\partial y}$, respectively, such that both said variables ideally approach zero.

19. The method of claim 18 in which at least one additional strain rate variable is minimized,
wherein said strain rate variables are selected from the group consisting of $\frac{\partial u}{\partial x}, \frac{\partial v}{\partial x}, \frac{\partial v}{\partial y}, \frac{\partial v}{\partial z}, \frac{\partial w}{\partial x}, \frac{\partial w}{\partial y}$ and $\frac{\partial w}{\partial z}$.

20. The method of claim 18 further comprising:
providing at least one OH-SBC having a length, width, depth, top, bottom, an interior and exterior side, upstream from and adjacent to said barrier,

said length oriented parallel to said upstream side of said barrier and said top generally parallel to the surface of said water,

wherein said OH-SBC comprises:

a main portion with at least one slot opening at said bottom; and

at least one extension that projects upstream from said at least one barrier along said width,

at least one internal sluiceway circumscribed at least in part by said extension and running parallel to said upstream side of said at least one barrier;

at least one collector gallery that parallels said sluiceway immediately adjacent said upstream side of said at least one barrier and is circumscribed at least in part by said main portion of said OH-SBC; and

at least one articulating extension affixed to said lower part of said collector gallery; and

at least partially de-watering said collector gallery to move said fish around said barrier.

21. A barrier incorporating a system simulating at least one natural hydraulic cue to which fish are responsive in water,

wherein said fish that respond to said at least one simulated hydraulic cue circumvent at least one barrier to the downstream migration of said fish, said barrier having at least an upstream and a downstream side.

22. The barrier of claim 21 in which said barrier is selected from the group consisting of a dam, a hydroelectric powerhouse, a weir, a boom, a sluice gate, a spillway, a berm, and combinations thereof.